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[54] Name of Invention Oleoresin composition

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Detailed Statement

1. Name of invention

Oleoresin composition

2. Scope of patent claim

It is an oleoresin composition characterized by a synthetic resin base wherein the liquid lubricant is composed of fine particles coated with a thin film of high molecular material.

3. Detailed explanation of invention

Field of Industrial Usage

This invention is concerned with the Oleoresin composition for sliding that has excellent friction and abrasion characteristics and is further concerned with an oleoresin composition suitable for sliding wherein a liquid lubricant composed of coated fine particles covered with a thin film of high molecular material is used as an oil retainer.

Relative Art

In the past, the lubricants were added to synthetic resins in order to improve the friction and abrasive characteristics of synthetic resins.

For example, the Examined Patent Publication No. 48 - 35572 describes the method wherein the organic and inorganic powder with specific surface area more than 0.01 m^2 / g is used as an oil retention carrier and then higher fatty acids, their salts, esters, amides, chlorinating agents or more than1 types selected from metallic soaps or these along with mineral oil are adsorbed to the surface of such fine powder and uniform dispersion in synthetic resins.

Moreover the Examined Patent Publication No.53 - 11018 describes the method in wherein a thermoplastic resin in which the oil dissolves at a temperature of flow temperature +10 ° C of the base resin or which absorbs the oil is used as oil retention agent and this thermoplastic resin which has swelled on absorbing the oil is uniformly dispersed in the base synthetic resin.

However, according to these methods as the lubricant is dispersed in the oil holdback agent or the base resin, which retains the oil retention agent, the lubricant does not transit easily on the sliding surface and there is still a problem of insufficient lubricity under severe usage conditions.

One the other hand methods of obtaining a porous (quality) synthetic resin molding by heating and molding synthetic resin powders mixed with powders of water soluble inorganic salts, etc. and then impregnating the molding in water and dissolving and removing salts as well as methods in which lubricants are impregnated in these pores are also known.

Though the permeation of oil on the sliding surface by this method was good, the oil was absorbed and dispersed on the sliding surface in a comparatively short period of time due to the pumping effect and as such there was a problem that the lubrication effect could not be sustained.

Further in the (Kokai) Unexamined Patent Publication No. 51 - 101047, the manufacturing method of oil - bearing plastic composition is stated wherein the oil - bearing plastic composition is molded by adding to synthetic resins the lubricating oil, organic and inorganic powder that absorbs lubricating oil and organic fibers which improve surface permeation of lubricating oil, and then by fusion kneading with the help of an extruder with more than 2 screw shafts. In this method, though the lubricant which is absorbed or adsorbed by organic and inorganic powder acting as a carrier is dispersed and permeated to the surface through the surface irregularities and internal perforations of the organic fibers, a special device is required for uniform dispersion of oil holdback carrier and since the role of organic fibers is supplementary, it is yet inadequate in transferring lubricant to the sliding surface.

Problems to be solved by this invention

Purpose of this invention is to solve the problems present in the conventional techniques mentioned earlier and to obtain the synthetic - resin composition for easy sliding by transferring the lubricant to the sliding surface.

If the purpose of this invention is to be stated more concretely, such an oleoresin should be obtained whose handling is easy and there is no trouble due to oil separation during molding. The oleoresin composition for sliding which is to be obtained should be such that it can maintain the lubrication results for a long term together with satisfactory oil retention, moderate suppression of oil permeation in base synthetic resins along with satisfactory oil permeation to the sliding surface and by using an oil retainer with excellent moldability.

In the results of the prior research, the inventor has shown that the above purpose can be achieved by adding capsular tiny particles coated with thin film of high polymer liquid lubricant as an oil retainer to base resins and this invention is accomplished based on this knowledge.

Means to solve problems

In other words, the gist of this invention lies in the oleoresin composition characterized by the presence of capsular tiny particles coated with thin film of high polymer liquid lubricant in base resins.

In this invention, liquid lubricants wherein the coated fine particles covered with a high molecular thin film i.e. high molecular micro capsules which have a liquid lubricant as their core material (substrate) are used instead of using fine powders with surface adsorption (sorbability) or synthetic resin swelled with oil similar to the conventional technology to retain the liquid lubricant in the base resin.

Hereafter, the components of this invention are described in detail.

(Base synthetic resin)

Thermoplastic synthetic resins such as polyamide, polyacetal, polycarbonate, polyethylene, polyethylene terephthalate, polypropylene, polybutylene terephthalate, poly phenyleneoxide, polyphenylene sulfide, styrene system polymer, acrylic fiber system polymer, polysulfone, polyallyl sulfone, polyallyl ether used as base synthetic resins have high heat resistance. Or there are thermosetting resin or elastomers such as phenol resins,

epoxy resins, polyester resins, urea resins and diallyl phthalate resins etc. Amongst these, high - density polyethylene, polyamide and polyacetal, etc. can be used desirably.

Arbitrary forms such as powders or pellets of these synthetic resins can be used.

Solid lubricants of four fluorinated resin powder, molybdenum disulfide, graphite, boron nitride, fluorinated black lead etc. or well - known inorganic filling materials and metal powders of glass fiber, talc, kaolin, calcium carbonate, powdered glass, carbon fiber and asbestos can be added in these base substance synthetic resin. Also stabilizers and small quantity of lubricants can also be added.

Though these additives can be blended in the base synthetic resin in advance or can be added during mixing of each component of this invention and during melting extrusion etc.

(Liquid lubricant)

For instance, paraffins such as spindle oil, refrigerating machine oil, dynamo oil, turbine oil, machine oil, gear oil, etc. and naphthenic mineral oils, greases, hydrocarbon oils, silicon oil, ester oil, polyglycols, polyphenyl ethers, halocarbonic synthetic oil, and fluorine oil, etc. or a wide range of lubricants available in the market can be selected as liquid lubricant in this invention. Moreover, saturated fatty acids, unsaturated fatty acids, fatty acid esters, fatty acid amides, metallic soaps and high - level alcohol etc. can be used together as a lubricant improver.

(Coated film corpuscles)

The oil retention agent used in this invention is a liquid lubricant containing coated fine particles covered with a high molecular thin film. These coated film particles can be manufactured by a method similar to the microcapsule used in carbonless paper.

In other words, conventional microcapsule technology wherein high molecular film is formed on the connoted core material or on the surface of a solution of the core material can be used.

The microcapsules are minute receptacles of normal μ diameter to 100 μdiameters and in this invention the liquid lubricant is sealed in these receptacles as a core material.

For instance, method of using the high molecular coacervation mechanism by applying the principle of complex coacervation with gelatin and arabia rubber, In - Situ method of in situ polymerizing polyurethane, etc. in to a high molecular film by interfacial poly condensation etc., method forming a film structure on the surface using a high molecular solution and then dehydrating the solvent element in the liquid, and additionally techniques such as forming melamine - formalin resin or urea - formalin resin micro capsules, etc. by interfacial polycondensation of polyurea capsules or initial condensates of thermosetting resin, etc. can be used as production methods of microcapsules.

These microcapsules should not breakdown (be destroyed) due to the mixing shear force or the processing heat at the time of adding and dispersing in the base synthetic resin. Consequently, the high molecular material, which becomes the wall material (film), should be selected carefully so that the microcapsule is not destroyed under the processing conditions or processing state of the base synthetic resin. For instance, when polyacetal whose working temperature is 170°C ~ 190°C is used as the base synthetic resin, a urea system thermosetting resin is suitable as the high molecular material which becomes the wall material.

Thus, the film corpuscles used in this invention depend on the characteristic of the kinds of connoted liquid lubricants or the high molecular material, which forms the coat film. Various processing methods can be selected and the high molecular material, which forms the coat film, can be selected according the processing conditions, etc. of the base resin.

(Mixing method)

As mentioned above the base synthetic resin used in this invention can be selected from a wide range of plastics and elastomers and even those available commercially in the market can be used. Depending on whether the

base synthetic resin is a thermosetting resin or a thermoplastic resin or a liquid casting resin, etc. and their respective processing characteristics, the high molecular microcapsules (coated film corpuscles) which form the core material of the lubricant can be uniformly dispersed in the base synthetic resin using common mixing methods.
Also, an impulse oil impregnated coating layer can be formed by dispersing the high molecular microcapsule in a coated resin solution made by dissolving the base synthetic resin in water or an organic solvent, etc. and then spreading and drying on the surface of the sliding material.

In addition, though the solid lubricating agents, lubricants, stiffeners, and stabilizers, etc. can be added in the oleoresin composition of this invention, the addition can be carried out by simpler methods than the usual mixing methods. Moreover, depending on the processing characteristics of the base resin the oleoresin composition of this invention can be molded by using various molding methods such as the usual injection molding, extrusion molding, compression molding, casting or coating, etc.

Function

When Oleo resin composition of this invention is used as a sliding material, lubricant which is distributed uniformly in the base substance composition resin breaks polymer micro capsules assumed to be padding material and wall material by pressure and friction in sliding surface, liquid lubricant of padding material is exuded on the sliding surface and remarkable lubrication effect is demonstrated as a result of that.

Moreover, as the high molecular microcapsule lubricant is connoted in high molecular thin film there is no stickiness due to the lubricant and as it can be handled as fine particles with good fluidity it is excellent in processing at the time of adding and dispersing in the base synthetic resin. Also as there is no trouble due to oil separation at the time of molding a large amount of lubricant can be included easily as compared to the conventional oleoresin compositions. Moreover, as the liquid lubricant in the base synthetic resin is connoted with high molecular coated film, the exudation (oozing) is controlled (checked) and since each and every high molecular microcapsule is dispersed independently, the exudation (oozing) of the added lubricant on the sliding surface occurs gradually and the lubrication effect can be continued for a long time.

Embodiments

Hereafter, this invention is further explained in detail by enumerating embodiments but is not limited to these embodiments only.

Embodiment

Coated film corpuscles having excellent fluidity with 80 % by weight of ester oil and 20 % by weight of urea system thermosetting resin was obtained by using Hindart ester oil as the core material and a urea system thermosetting resin as the high molecular material for coating the core material. The particle diameter of the corpuscle was 2 - 3 μm.

10 % by weight of coated film corpuscles were added to polyacetal resin and after mixing in a large - scale mixer at room temperature it was uniformly dispersed by melting mixing in a biaxial kneader extruder at 180 °C. Even when melting shear force was applied at the time of kneading the coated film corpuscles did not breakdown and a kneaded mixture (tempered mixture) with no stickiness due to oil was obtained.

Using this a 2 mm thickness sample was molded with an injection molding machine and when a thrust friction test was carried out under sever conditions wherein the polyacetal resin was melted and baked the oil exuded (oozed) on the sliding surface and a slight sliding wear was noticed but there was no melting and baking and it showed an excellent lubricating effect.

The thrust friction test conditions were as follows.

Other material: S45C cylinder with 9.6mm inner diameter, 11.6 mm external
Weight: 40 Kg

Speed constant: 0.3 m / second
Time: 10 minutes

Effect of invention

According to this invention, as coated film corpuscles covered with a thin film of high molecular material are added in a base synthetic resin as an oil retention agent in the liquid lubricant, the handling is easy at the time of molding process as the oil element can be treated as a solid powder and there is no trouble with oil separation at the time of molding as in the case of conventional oleoresins and the moldability (formability) is also excellent. Moreover, when the oleoresin composition of this invention is used as a sliding material, the high molecular material which is coated on the core material breaks down by the heat and pressure caused due to the friction with the other material and the liquid lubricant of the core material easily exudes (oozes out) on the sliding surface and a remarkable lubricating effect is demonstrated. Therefore, the oleoresin composition of this invention is useful as sliding material for axles cum sliders.

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